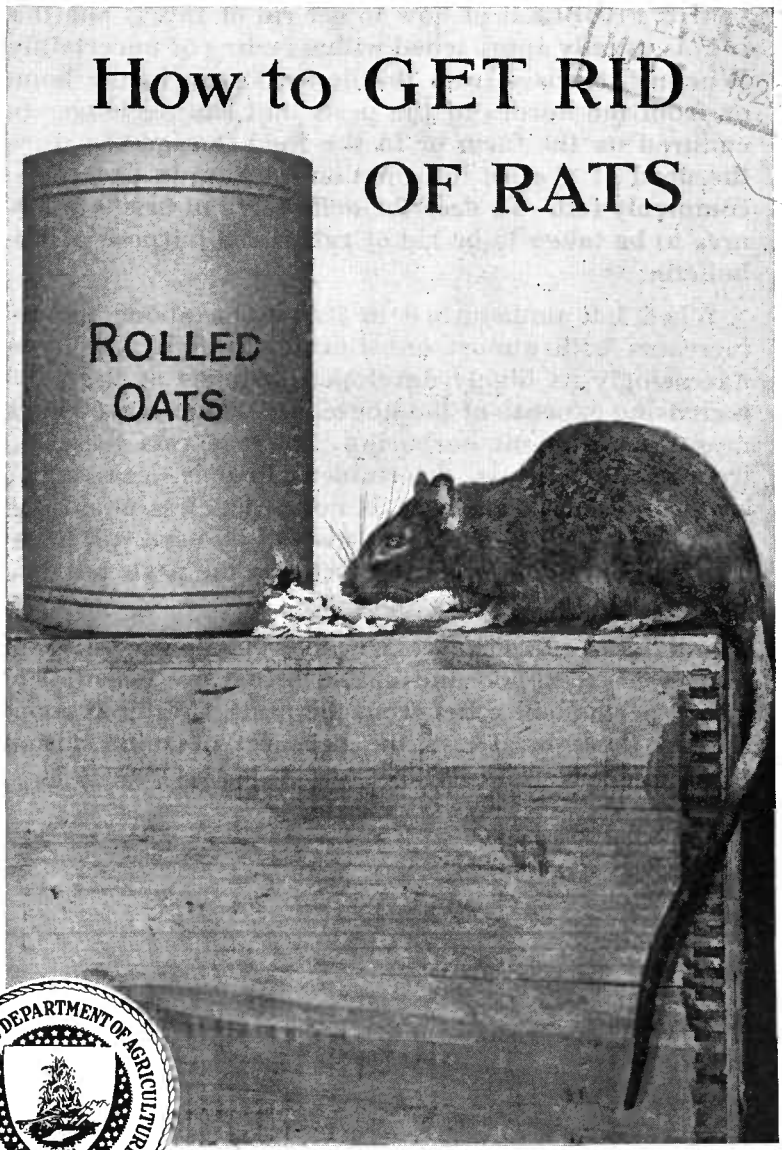
U. S. DEPARTMENT OF AGRICULTURE
FARMERS' BULLETIN No. 1302

How to GET RID OF RATS



THE PROBLEM of how to get rid of rats is one that is usually approached with a feeling of uncertainty. Whether it arises from the first rat seen in the home or from the hordes of the pests that can no longer be endured on the farm or in the food-storage structure, the need of precise information on how to proceed is commonly felt. To describe definitely but briefly measures to be taken to be rid of rats is the purpose of this bulletin.

When left undisturbed in its chosen abode the rat increases with almost unbelievable rapidity and uses unceasingly its highly developed instincts at the ever-increasing expense of the housekeeper, farmer, or business establishment harboring it. Once rats have entrenched themselves, determined effort is necessary to eradicate them. The task is not a hopeless one, however, and effective measures persistently used will benefit not only the one-time supporter of the pests but also the community at large.

Individual effort is necessary to rat riddance, but community organization and united action are essential to insure permanent relief from the pests. Without cooperation there is always the prospect of reinfestation from adjacent property.

Washington, D. C. Issued April, 1923

HOW TO GET RID OF RATS.

By JAMES SILVER, *Biological Assistant, Division of Economic Investigations, Bureau of Biological Survey.*

CONTENTS.

INTRODUCTION.

THE ENORMOUS demand for more efficient means of rat destruction provides a ready field for the exploitation of an endless variety of control methods. Advertisers and manufacturers of poisons, traps, and viruses, and of countless contrivances, flood our newspapers and magazines with an imposing array of plausible arguments and flattering testimonials, proclaiming their products as the best and only sure way to rat riddance. The result is that vast sums of money are literally thrown away on worthless substances and devices designed to outwit the wily rat. If the products were only half as effective as the salesmanship, the days of the rat would be numbered. This does not mean that all proprietary anti-rat products are without merit, but rather that extensive advertising does not always insure results satisfactory to the purchaser.

It has been found in the experience of investigators and demonstrators of the Biological Survey that a few simple measures consistently employed will rid a farm or a community of rats. Natural agencies unaided, such as cats, dogs, birds of prey, etc., can not be wholly relied upon to do the work for us. Control measures must be intelligently applied, and the results regularly noted. Rats are hard to exterminate, and regardless of the method employed success attends only close application and persistent effort. It is a case of man matching his wits against the highly developed instincts of the rat.

The large number of failures to exterminate rats is due in part to the use of inefficient methods, but half-hearted effort and easy discouragement are more often responsible. Rats can not long survive a concerted and sustained onslaught. They can be eliminated from any ordinary building or farm by the intelligent and judicious use of the methods here described.

The all-important measures to be taken are the removing of food and shelter from rats, poisoning and trapping them, and under certain conditions fumigating their burrows. These measures should be undertaken not only by individual effort but also through community cooperation.

ELIMINATING FOOD AND SHELTER.

Thorough cleanliness and orderliness discourage the presence of rats and constitute a strong incentive for them to seek other quarters. To eliminate food and hiding places entirely is to eliminate rats. This is not always possible, but the nearer the approach to this condition the more simple the rat-riddance problem becomes.

B2008M

FIG. 1.—Trash pile in rear of restaurant. Accumulations of this kind furnish food, shelter, and breeding places for rats. Such conditions should be controlled by suitable city ordinances and competent inspection.

The most important means of eliminating food and shelter are to store foodstuffs in rat-proof containers, to dispose of waste and garbage in tightly covered vessels, and to prevent the accumulation of trash, refuse, and other similar material (Fig. 1). Not only does lack of food and shelter reduce the breeding rate of rats, but increased hunger renders poisoning and trapping more effective.

POISONING.

The most efficient means known to the department for destroying rats is by poisoning, and poison is recommended for the purpose wherever it can be used with safety. Powdered barium carbonate is

an inexpensive mineral, and seems best adapted for poisoning rats.[1] It is both odorless and tasteless, and baits containing it are readily taken by these pests (Fig. 2). It also has the advantage of being slow in its action, so that rats affected by it usually have time to leave the premises in search of water or to return to their burrows before they succumb.

The following directions for using barium carbonate have been carefully worked out and should be closely followed to obtain the best results.

B1962M

FIG. 2.—The result of an over-night campaign in a public market. Barium carbonate baits, prepared and exposed in accordance with the instructions contained in this bulletin, were used.

KINDS OF BAIT.

A variety of baits used separately not only gives the rat a choice of foods but tends to make it less suspicious. One kind of each of the following classes of food mixed with barium carbonate is recommended:

(1) *Meat or other animal substance.*—Hamburg steak, sausage, fish, liver, bacon, or cheese.

(2) *Vegetables and fruits.*—Thin slices of muskmelon, apple, tomato, or cucumber; canned corn, or squash or pumpkin seed; or mashed banana, boiled carrot, or baked sweet potato.

(3) *Cereals.*—Rolled oats, bread, corn meal, flour, or cake. Kitchen scraps and garbage can be worked into the ration to advantage.

Baits should be fresh and preferably of good quality.

[1] Other poisons commonly used are phosphorus, arsenic, and strychnine. Phosphorus is attended with danger from fire; arsenic is uncertain in its action; while strychnine is readily detected by rats and is too rapid in its action to make its use desirable in buildings. Barium carbonate has the advantage of being not only of proved effectiveness, but also inexpensive and relatively safe.

HOW TO PREPARE BAITS.

The powdered barium carbonate should be thoroughly mixed and worked into the soft baits in the proportion of 1 part of the mineral to 4 parts of the selected food. Add water when necessary to make the baits moist. Baits moistened to the consistency of soft mush are particularly acceptable to rats in dry weather.

Barium carbonate should be sifted over sliced baits and rubbed well into them with the fingers or a knife. The slices should be thin and should be moistened if necessary in order to attain as nearly as possible the 1 to 4 ratio. Soft baits may be mixed with the hands or with a spoon.

HOW TO DISTRIBUTE POISON.

A teaspoonful, or its equivalent, of each of the three or more kinds of baits prepared, should be exposed in places frequented by rats. In buildings baits should be set on strips of paper or boards where they may be easily removed.

A convenient and successful method of exposing baits is to place a teaspoonful in each of a number of small paper sacks and drop them in places accessible to rats or frequented by them. The sacks should be closed by twisting the top. Bait distributed in this manner serves to allay the suspicion of rats and will be taken by them more readily than if exposed in the open. It is better not to place the sacks near or at rat holes, but rather to scatter them promiscuously about. The sacks are usually carried into burrows or behind objects, where the contents are eaten in comfort and are more nearly consumed than in the open. In public places, where there is a possibility that the bait will be disturbed by people, the sacks should be labeled "POISON."

Baits of three or more kinds should be exposed in groups. Where rats are abundant baits may be exposed at intervals of 10 to 20 feet. Uneaten baits should be picked up the following morning and destroyed. If left exposed in warm places more than one day, baits will sour, and the resulting acid will gradually transform the barium into a bitter and highly objectionable form. Continue to distribute fresh baits in less quantity each night, repeating those that are eaten freely, and replacing those less relished, by others in the same class until the rats disappear or until no further baits are taken.

In stubborn cases it may become necessary to resort to prebaiting in order to dispose of old and cunning rats. This consists in exposing unpoisoned or fresh foods every night until rats take them freely, and then substituting the poisoned baits.

Poison used in poultry inclosures should be exposed in places inaccessible to chickens, as behind or under boxes, and it should be very wet or of such nature that the rats can not drag it from cover.

Caution.—Barium carbonate is a relatively mild poison, but the danger from accidents can not be over emphasized. *Keep it out of the reach of children and irresponsible persons and from domestic animals and fowls.*

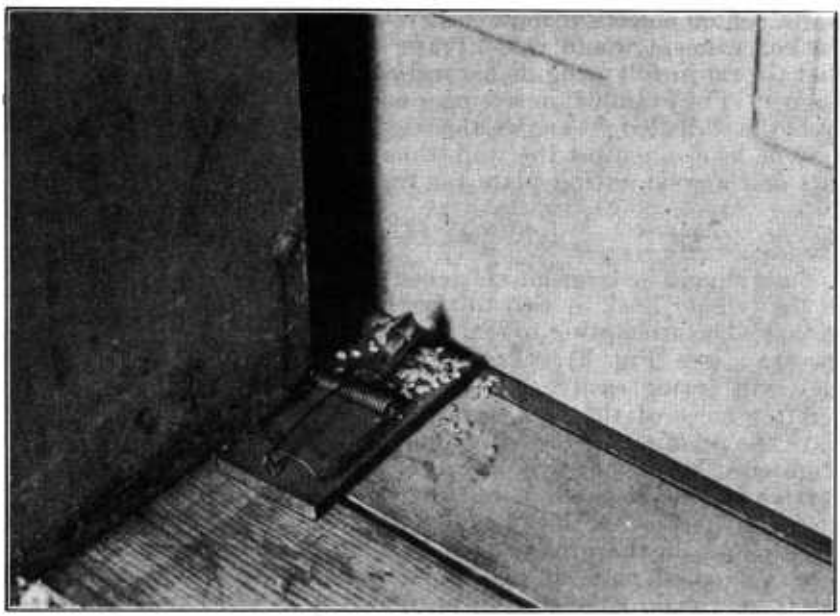
Antidote.—Give an emetic consisting of either mustard or salt dissolved in warm water, or induce vomiting by inserting the finger in the back of the throat. Follow vomiting with a liberal dose of Epsom or Glauber salts.

TRAPPING.

Trapping rats, while equally as effective as poisoning, requires more skill and labor. It is recommended where the use of poison seems inadvisable.

Careful attention to detail is necessary in trapping rats, as the measure of success will depend largely upon the skill and resourcefulness with which the traps are handled.

While numbers of the more complicated traps and devices for catching rats are sometimes useful, the simple and inexpensive snap trap, sometimes called " guillotine," " spring," or " break back," has easily proved the most effective and consistent rat catcher (Fig. 3). There is little choice between the standard makes of this style of



B2000M

FIG. 3.—An excellent type of trap properly set in a natural runway of the rat. In this instance the runway is back of a box placed a few inches away from the wall. When using such a runway the rat must pass over the trigger of the trap.

trap, and selection should be governed by strength and apparent durability. The essential is a trigger that will release the spring at a very light touch. The trigger should also be provided with a hook or other means of holding the bait fast. Large triggers have an advantage over small ones, as they have a greater surface for the rat to step on, and especially as they are better adapted for use along walls and narrow runways, where rats may be trapped successfully without baiting.

In trapping, as in poisoning, the kinds of baits used are of prime importance, and to give the rat a choice of foods and to lessen its suspicion the same principle of variety is equally applicable.

To get the best results the following directions for baiting and setting snap traps should be carefully observed.

KINDS OF BAIT.

Rolled oats, fried bacon, bread, and toasted cheese are the baits most frequently used. Baits which will easily adhere to the trigger hook, as fried bacon, raw or cooked meats, fish, nut meats, cheese, apples, or carrots, are recommended for general use. These may be made more attractive by sprinkling rolled oats or corn meal lightly over the trap. Almost any food suitable for human consumption will appeal to the gluttonous appetite of the rat, so that there should be no lack of variety.

WHERE TO SET TRAPS.

Rats rely on concealment for protection and avoid open spaces as much as possible. The best place to set traps, therefore, is close to walls, behind objects, in dark corners—anywhere that a rat in striving for concealment would run. Traps should be set in such a manner that the rat in following its natural course will pass directly over the trigger. For example, in setting along a wall the trap should extend from the wall at right angles, the trigger end close against it. Boards may be leaned against the wall, thus forming a natural runway for rats and a good setting place for traps.

HOW TO SET TRAPS.

Baits should be large and fastened securely to the trigger by means of the trigger hook or tied to the trigger with thread or fine wire, so that when attempting to remove them the rat will be sure to spring the trap (see Fig. 3). Traps should be set very lightly, so that they will spring easily.

After most of the rats have been caught, the others sometimes leave the premises. More often, however, the remaining rats are not frightened away, but avoid baits and prove very difficult to catch. Strategy must be used in outwitting such individuals. The most successful method is to camouflage the traps.

Traps set on the ground may be sunk slightly below the ground level. A small piece of paper or cloth should then be placed over the trigger end of the trap to prevent dirt from getting underneath and clogging the action, and the whole should be lightly covered with fine earth or sawdust.

The same method may be employed on hard floors, by burying the traps in a shallow pan of meal, sawdust, or grain. A trap set in this way may be placed in a runway without baiting, or several pieces of bait may be scattered over it. In stubborn cases, food may be exposed on pans of meal until the rats take it readily, when the traps should be set in the meal. Stones, boxes, or boards will often aid in directing an unsuspecting animal along an easy path over a trap.

GENERAL TRAPPING INSTRUCTIONS.

The presence of an abundance of food makes trapping much more difficult. Before starting a trapping campaign remove all accessible food and eliminate the sources of supply.

Plenty of traps should be used. Trying to catch a hundred rats with half a dozen traps will make those not caught suspicious and

dishearten the trapper long before the job is completed. A dozen or more traps for a heavily infested dwelling and from 50 to 100 or more for farms and larger buildings are not too many. It is important that a sufficient number of traps be obtained to make the campaign short and decisive. The cost of traps is little compared with the loss occasioned by rats.

Traps should be kept in good working condition and should be carefully examined before setting to insure their instant operation. They should be kept reasonably clean, and if they become very foul, should be boiled and scraped. When trapping is done on a large scale, especially in damp places where metal parts of the traps may rust, an occasional dipping in melted paraffin will lengthen their usefulness, cause them to spring more easily, and have a deodorizing effect.

Trapping rats in larger buildings and on farms should be assigned to a man with a natural aptitude for such work. When interest is taken, only slight training is necessary for some men to become proficient in the work. Such men should be encouraged to persistent effort.

FUMIGANTS AND DETERRENTS.

CARBON BISULPHIDE.

In many places rat burrows may be fumigated with carbon bisulphide and the rats thus destroyed in the ground. This method is effective in fields, along ditch banks and levees, around farm buildings, and in dirt cellars, providing the burrow is dug in solid earth. The gas is more effective in heavy damp soils and in wet weather.

A wad of cotton or other absorbent material should be saturated with 1 ounce (2 tablespoonfuls) of carbon bisulphide and thrown or pushed as far as possible into each burrow; all burrow entrances should then be closed with moist earth to prevent the escape of the gas. A long pair of forceps is convenient for handling the absorbent material.

Caution.—*Carbon bisulphide is highly inflammable and explosive and should not be approached by fire.* It evaporates rapidly and should be kept in an air-tight container.

GASOLINE ENGINE EXHAUST.

Use of the exhaust of an automobile, tractor, or other gasoline engine in fumigating rat burrows is entirely practicable when there are only a small number of holes. The exhaust is directed into the rat burrow by means of a hose and the entrance around the hose is sealed with damp earth (Fig. 4). The carburetor is adjusted to obtain a rich mixture and the engine allowed to run at moderate speed for 10 minutes or more. This method may also be used successfully in destroying rats beneath floors or in other places where a concentration of the gas can be obtained.

NAPHTHALENE FLAKES.

In seed warehouses and similar structures where sacked grain is stored temporarily, or otherwise, it has been found that a liberal

supply of flake naphthalene, scattered on the floor about the stacked grain and over the bags, is objectionable to rats and will keep them away. In the seed distribution work of the Bureau of Plant Industry of this department the need of a cheap repellent was felt because of the fact that the many tons of seeds sometimes on hand could not be placed in rat-proof rooms. Flake naphthalene was tried in 1912 and proved so satisfactory that it has been used continuously ever since. The flakes are scattered abundantly over bags of seed as they are stacked and also in bins and rooms containing filled packets. The naphthalene does not damage the seed in any way and can be used with impunity in any reasonably tight building. Because of its odor, the use of the naphthalene flakes is not recommended in places where food and feedstuffs are stored, unless the nature of the material is such that it can be thoroughly deodorized by airing before use.

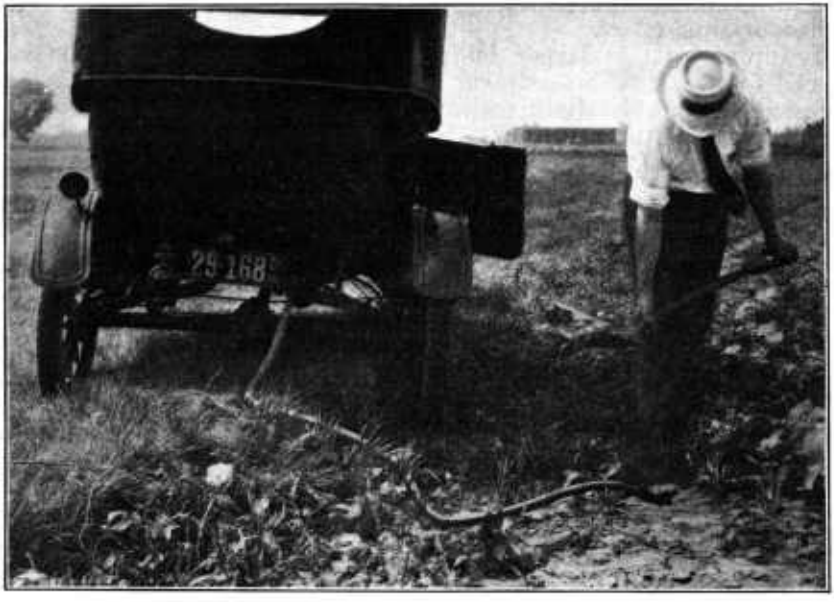


FIG. 4.—Fumigating rat burrows by means of gasoline-engine exhaust.

RAT-PROOFING.

Poisoning, trapping, and other extermination methods carefully applied will give relief of more or less uncertain duration, but so long as there are rats in a neighborhood and they find it possible to get inside a building, there is always the danger of reinfestation. The only sure and final remedy for the rat nuisance is rat-proof construction. Without it, rats will get into a house, by gnawing if necessary, in order to locate an available and easily obtained food supply. The rat must be built out.

Most modern buildings and many older ones are so constructed as to be proof against the ingress of rats or could be made so at a

relatively small cost. Owners of large warehouses, food depots, and other buildings where produce and other supplies are exposed to rat depredations have found that the cost of rat-proofing their buildings, even when the expense is considerable, is slight compared with the value of the resulting protection from loss, and that, in the long run, it is the cheapest rat insurance (Fig. 5). Rat-proofing of buildings, wherever it can be accomplished at reasonable expenditure, is recommended as the best and most permanent means of rat riddance.

B2007M

FIG. 5.—Build them out; the only sure and final way to rat riddance.

After having eliminated rats from a building by poisoning or trapping, reinfestation may often be prevented by closing with metal sheeting, or with concrete containing broken glass, all small openings that provide entrance for rats, and by screening basement windows and other large openings (Fig. 6). Rat-proofing should be planned for in the construction of all new buildings or in the remodeling of old ones. Building regulations, requiring that all structures be made rat-proof under competent inspection, would have a wholesome influence on future efforts at rat riddance.

Further information relative to rat-proof construction and repair and other measures looking toward permanent relief from the rat pest will be furnished on receipt of request addressed to the department.

NATURAL ENEMIES OF RATS.

Cats that are of real value as ratters are rare. Ferrets are valuable only when handled by experienced men aided by good dogs. The use of dogs in killing rats is recommended wherever practicable—small terriers, particularly when taught to hunt by themselves, are useful and sometimes will keep a farm free from rats.

While naturally burrowing rodents, rats do not ordinarily become excessively abundant in fields and woodland, because of their numerous natural enemies among the smaller predatory animals and birds of prey. If the relation of hawks and owls to rat infestation on the farm were better understood, the killing of such valuable

B2069M

FIG. 6.—Heavy wire screen of ¼-inch mesh will effectively close basement windows against rats.

birds would be confined to those actually caught preying upon poultry, and others would be left to their work of reducing the numbers of injurious rodents. (Fig. 7.) This policy would tend to lessen the number of the three [2] species of hawks and owls that live to any extent on poultry and birds, while the more than 40 beneficial species of predacious birds of these groups would be spared.

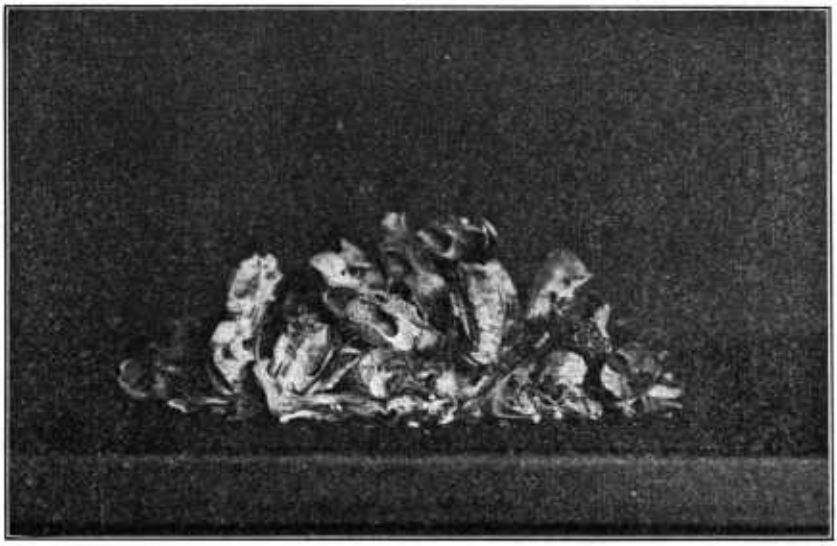
[2] These harmful hawks and owls are the Cooper hawk (*Accipiter cooperii*), the sharp-shinned hawk (*Accipiter velox*), and the great horned owl (*Bubo virginianus*). The duck hawk (*Rhynchodon peregrinus anatum*) and the goshawk (*Astur gentilis atricapillus*) are also classed as injurious but are too rare to be of consequence. The Cooper and sharp-shinned hawks destroy 90 per cent of the poultry and birds for which hawks and owls are responsible. The great horned owl is capable of great service in combating rats and other rodents and becomes a pest only where these are scarce and poultry runs at large. (See Fisher, A. K., "Hawks and Owls from the Standpoint of the Farmer": Biological Survey Circular No. 61, U. S. Dept. Agr., pp. 18, figs. 6, 1907.)

VIRUSES.

The control of rats by means of bacterial disease has a peculiar appeal that creates a ready market for the varied cultures already on the American market. This method, however, has proved generally unsatisfactory both in the experience of the Biological Survey and of other investigators and users, as gathered from reports from outside sources.

COMMUNITY COOPERATION.

When rats are known to hide and nest in large numbers in piles of lumber, sacked grain, hay or straw stacks, corn shocks, trash piles, and the like, an excellent means of destroying them is to inclose such places with a portable rat-proof fence, throw out the straw,



82077M

FIG. 7.—Twenty rat skulls were found in pellets taken from the nesting site of a pair of barn owls in Washington, D. C. Owls are an aid in warfare against the rat pest.

lumber, or other material, and kill the rats with clubs or by the aid of dogs.

Rat hunts are often organized in rural communities, or rat-killing contests between rival teams, organizations, or communities are arranged, which result in large kills and furnish excellent sport to the participants.

Although the control of rats is largely an individual problem, rat infestation has a serious effect on the whole community, and organized effort is highly desirable. A man who allows rats to increase on his property until they menace the entire neighborhood, or a city dump which serves as an incubator for hordes of the pests, become matters of public concern. The elimination of rats from a whole community can best be accomplished only by the organized effort of all the citizens.

Organized anti-rat campaigns are increasing in popularity and are becoming the regular program not only in many municipalities and

counties, but also in whole States. Such campaigns are of great value from economic, educational, and sanitary standpoints.

Assistance in planning, organizing, and prosecuting organized anti-rat campaigns will gladly be given by the Biological Survey in the form of direct aid whenever practicable, by an expert for campaigns of large scope, or by furnishing plans, general instructions, publicity material, and sample posters.[3]

B1113M

FIG. 8.—Taking the profits out of poultry raising. The rat is the most destructive animal in the world, and damage to poultry is a common cause of complaint against the pest.

SUMMARY.

Close all openings which provide entrance for rats, and screen basement windows in buildings that are otherwise rat proof.

Insure greater cleanliness; promptly dispose of garbage and eliminate piles of trash and refuse.

Poison with barium carbonate on farms and dumps, in farm structures, warehouses, and other buildings, and, where considered advisable, in dwellings.

Trap systematically with common snap traps when the use of poison is inexpedient.

Fumigate burrows and keep efficient rat dogs to assist in reducing the infestation on farms.

Organize cooperative rat hunts and plan a definite and determined campaign of rat riddance.

---

[3] It is desirable, for the common good, that reports be sent to the Biological Survey, U. S. Department of Agriculture, of any marked success in efforts to be rid of rats, either by following the methods recommended in this bulletin or by employing others. If the methods here advocated do not prove successful, a statement of the facts in the case, describing the situation in detail, will be appreciated. Special attention will be given such cases with a view to overcoming the difficulties. Individual advice regarding rat riddance will be given when necessary.

Rats affect a larger percentage of the population than any other pest in existence. Infesting almost the entire world, they carry on unceasingly their work of destruction, of transmitting disease, and of inspiring repugnance or dread where they are present or threaten invasion of the home.

Damage by rats to produce and property in the United States amounts to about $200,000,000 annually. Injury to farm produce starts when the seed is first planted and continues through the growing season and harvest, in the wholesale and retail markets, and often in the home of the consumer. Such losses in the aggregate so affect the ultimate price of foodstuffs that everyone shares them, whether he maintains rats on his premises or not.

Modern ideas of thrift are opposed to such unnecessary waste, and the demand for relief is becoming insistent. What is most needed is a constant campaign of education to increase public intolerance of rats, carried on by extension and sanitation officials and all others interested. Individual efforts, which through the centuries have been ineffective in eliminating rats, must give way to organized endeavor.

For information regarding the relation of the rat to the public health, address the Surgeon General, United States Public Health Service, Washington, D. C. For information relative to the habits, life history, and economic status of the rat and for additional information in regard to anti-rat campaigns and methods of control, address the Bureau of Biological Survey, United States Department of Agriculture, Washington, D. C.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

Secretary of Agriculture	HENRY C. WALLACE.
Assistant Secretary	C. W. PUGSLEY.
Director of Scientific Work	E. D. BALL.
Director of Regulatory Work	———
Weather Bureau	CHARLES F. MARVIN, *Chief.*
Bureau of Agricultural Economics	HENRY C. TAYLOR, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Forest Service	W. B. GREELEY, *Chief.*
Bureau of Chemistry	WALTER G. CAMPBELL, *Acting Chief.*
Bureau of Soils	MILTON WHITNEY, *Chief.*
Bureau of Entomology	L. O. HOWARD, *Chief.*
Bureau of Biological Survey	EDWARD W. NELSON, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Fixed Nitrogen Research Laboratory	F. G. COTTRELL, *Director.*
Division of Accounts and Disbursements	A. ZAPPONE, *Chief.*
Division of Publications	JOHN L. COBBS, Jr., *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
States Relations Service	A. C. TRUE, *Director.*
Federal Horticultural Board	C. L. MARLATT, *Chairman.*
Insecticide and Fungicide Board	J. K. HAYWOOD, *Chairman.*
Packers and Stockyards Administration *Grain Future Trading Act Administration*	CHESTER MORRILL, *Assistant to the Secretary.*
Office of the Solicitor	R. W. WILLIAMS, *Solicitor.*

This bulletin is a contribution from—

Bureau of Biological Survey	E. W. NELSON, *Chief.*
Division of Economic Investigations	A. K. FISHER, *in charge.*

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1923